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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/705,360	11/10/2003	Bulent M. Basol	NT-313-US	4618

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EXAMINER
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WILKINS III, HARRY D

ART UNIT	PAPER NUMBER
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1742

DATE MAILED: 10/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/705,360

Applicant(s)

BASOL, BULENT M.

Examiner

Harry D. Wilkins, III

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 September 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-5,8-14 and 16-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5,8-14 and 16-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 9/18/06.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Status***

1. The rejection grounds using Andricacos et al have been withdrawn in view of Applicant's amendment requiring contact of the external influence with the surface.
2. The rejection grounds using Uzoh et al have been withdrawn in view of Applicant's remarks regarding the fact that Uzoh et al and Rodbell et al teach away from each other. Uzoh et al teaches forming a copper layer with more additive while Rodbell et al teach forming a copper layer with less additive.
3. The objection to claim 10 is withdrawn in view of Applicant's correction of the noted typographical error.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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6. Claims 1, 4-5, 8-14 and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Creutz et al (US 4,110,176) in view of Liu et al (US 6,004,880) and Rodbell et al (US 6,344,129).

Creutz et al teach (see abstract and cols. 3 and 4) electroplating copper on a substrate having a conductive surface including wetting the conductive surface with an electrolyte solution having a brightening agent. The brightening agent becomes adsorbed onto the entire conductive surface to facilitate electroplating. The process further included processing of the conductive surface by electroplating.

Thus, Creutz et al fail to teach (1) electroplating on a substrate that included a conductive surface with a top portion and a cavity portion, (2) applying an external influence which contacts the top portion, the influence removing a part of the brightener adsorbed on the top portion and (3) maintaining a low temperature environment.

Liu et al teach (see abstract, figures 1A-2 and associated description) the concept of electroplating on a microelectronic substrate that included top portions and cavity portions and applying an external influence through polishing pad 104 which contacted the top portion of the conductive surface to form a planar electrodeposited layer.

Rodbell et al teach (see abstract and paragraph spanning cols. 5 and 6) performing electroplating of copper on a microelectronic substrate that included top portions and cavity portions at reduced temperatures (0-18°C) for the purpose of decreasing the dopant levels in the electroplated copper layer.

Therefore, it would have been obvious to one of ordinary skill in the art (1) to have applied the electroplating method of Creutz et al to a substrate that included a conductive surface that included both a top portion and a cavity portion because Liu et al and Rodbell et al teach the desirability of using copper electroplating to make microelectronic devices; (2) to have used the device/method of Liu et al to have applied an external influence using the polishing pad 104 to the substrate because Liu et al teach (see col. 5, line 51 to col. 6, line 13) that the polishing pad was able to provide effective planarization of the electrodeposited layer simultaneously to the electroplating step, thereby decreasing the number of processing steps required; and, (3) to have maintained the electroplating environment at a low temperature as suggested by Rodbell et al for the purpose of decreasing dopant levels in the electroplated copper layer.

With respect to the limitation "the external influence removing a part of the first amount of the additive adsorbed on the top portion", the polishing pad of Liu et al would have been expected to have performed this function since it swept the conductive surface. If Applicant disagrees with this assessment, comparative results should be submitted which show that the combined CMP and electroplating process of Liu et al did not produce the claimed "removing".

Regarding claim 4, Rodbell et al fail to teach or suggest how the lowered temperature processing environment was achieved. However, it would have been obvious to one of ordinary skill in the art to have provided the low temperature of Rodbell et al by cooling the electrolyte solution. Such feature was well known in the

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prior art as evidenced by Andricacos et al, which teaches (see col. 6, lines 43-45) that suitable temperature control of an electrolyte was typically provided.

Regarding claim 5, Rodbell et al suggest temperatures of 0-18°C, preferably 5-15°C and most preferably 8-12°C.

Regarding claim 8, although Creutz et al teach electroplating of copper, Liu et al teach (see abstract and col. 5, line 51 to col. 6, line 13) simultaneous removal of conductive material utilizing the polishing pad in order to reduce the number of required processing steps.

Regarding claim 9, the processing of Creutz et al was electroplating.

Regarding claim 10, Rodbell et al teach forming a first layer by electroplating using a first electrolyte, and then forming a second layer by electroplating using a second electrolyte, wherein the first electroplating was used to fill holes and vias and the second electroplating was used to provide a planar overburden layer.

Regarding claim 11, Creutz et al and Liu et al teach wetting the conductive surface with an electrolyte solution having an additive adsorbed onto the conductive surface, applying an external influence by a polishing pad and processing (electroplating) the conductive surface. Rodbell et al teach performing a two-phase electroplating process, wherein the second phase of the process was performed at a lower temperature than the first phase. Thus, Rodbell et al suggest an intermediate chilling step. The external influence and processing (electroplating) would have been reapplied after the lower temperature electrolyte was introduced to perform the second phase of the process.

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Regarding claim 12, it would have been obvious to one of ordinary skill in the art to have utilized two distinct electrolyte solutions for the two-phase electroplating taught by Rodbell et al because of the different chemistry of reaction at the different processing temperatures.

Regarding claim 13, it would have been within the expected skill of a routineer in the art to have optimized the additive concentration in the first and second electrolytes to have adapted each solution to the specific conditions of the different phases.

Regarding claim 14, Rodbell et al suggest temperatures of 0-18°C, preferably 5-15°C and most preferably 8-12°C.

Regarding claim 16, Liu et al teach (see abstract) holding the wafer (integrated circuit) against the polishing pad.

Regarding claim 17, although Creutz et al teach electroplating of copper, Liu et al teach (see abstract and col. 5, line 51 to col. 6, line 13) simultaneous removal of conductive material utilizing the polishing pad in order to reduce the number of required processing steps.

Regarding claim 18, the processing of Creutz et al was electroplating.

7. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Creutz et al (US 4,110,176) in view of Liu et al (US 6,004,880) and Rodbell et al (US 6,344,129) as applied to claim 1 above, and further in view of Carl et al (US 6,436,267).

The teachings of Creutz et al, Liu et al and Rodbell et al are described above.

However, Rodbell et al was silent with respect to how to achieve the low temperature processing environment.

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Carl et al teach (see paragraph spanning cols. 6 and 7) a method whereby the temperature of a semiconductor substrate to be processed is chilled by first chilling the substrate support and contacting the wafer with the chilled support.

Therefore, it would have been obvious to one of ordinary skill in the art to have performed the step of maintaining a low temperature processing environment of Rodbell et al by cooling the substrate support and contacting the wafer with the substrate support.

With respect to the fact that the substrate support of Carl et al was used for PVD deposition of a seed layer and not electroplating, one of ordinary skill in the art would have realized that the substrate support of Carl et al with cooling fluid channels, could have been used with any semiconductor substrate process, such as electroplating, where such temperature control was necessary.

### ***Double Patenting***

8. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.



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Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

9. Claims 1-18 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-30 of U.S. Patent No. 6,534,116 in view of Rodbell et al (US 6,344,129). The claims of 6,534,116 teach the invention as claimed, with the exception of the requirement that the processing environment be kept at a low temperature. However, such feature would have been obvious to one of ordinary skill in the art in view of the teachings of Rodbell et al regarding the fact that a low temperature environment allowed a more pure electroplated copper layer to be formed. The various features of other dependent claims would also have been obvious to one of ordinary skill in the art similarly as described in the rejection grounds above.

#### ***Response to Arguments***

10. Applicant's arguments filed 18 September 2006 have been fully considered but they are not persuasive. Applicant has argued with regards to the double patenting rejection made by the Examiner, Rodbell et al does not teach any use of an external influence to contact the conductive surface of the workpiece.

In response, those features Applicant argues that Rodbell et al does not teach are included within the teachings of claims 1-30 of US 6,534,116, the basis for this obviousness-type double patenting rejection.

#### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

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§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

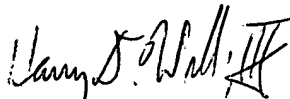
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Harry D Wilkins, III  
Primary Examiner  
Art Unit 1742

hdw